AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

Claims 1-3 (Cancelled).

4. (Currently Amended) The optical encoder according to Claim ~~1~~ 8, wherein the second grating is a reflective phase grating, and the first and third gratings are arranged on the same side ~~with respect to~~ of the second grating.

5. (Currently Amended) ~~The~~ An optical encoder ~~according to Claim 4~~ comprising:

an incoherent light source;

a first grating, which is an amplitude grating having a first grating period, for spatial amplitude modulation of the incoherent light from the light source;

a second grating, which is a phase grating having a second grating period, for spatial phase modulation of light from the first grating;

a third grating, which is an amplitude grating having a third grating period, for spatial amplitude modulation of light from the second grating; and

a light detecting element for detecting light from the third grating, wherein

the encoder detects relative displacement between respective gratings,

the second grating is a reflective phase grating, and the first and third gratings are arranged on the same side of the second grating, and

the second grating has ~~an indented shape with~~, in cross-section, ridges and valleys ~~and~~, a duty ratio of substantially 50%, ~~in which~~ and an optical path difference ~~between~~ for light incident at a ridge and light incident at a valley ~~of the second grating~~ is substantially equal to $\lambda/4$, where λ is wavelength of light.

6. (Currently Amended) ~~The~~ An optical encoder ~~according to Claim 4~~ comprising:

an incoherent light source;

a first grating, which is an amplitude grating having a first grating period, for spatial amplitude modulation of the incoherent light from the light source;

a second grating, which is a phase grating having a second grating period, for spatial phase modulation of light from the first grating;

a third grating, which is an amplitude grating having a third grating period, for spatial amplitude modulation of light from the second grating; and

a light detecting element for detecting light from the third grating, wherein

the encoder detects relative displacement between respective gratings,

the second grating is a reflective phase grating, and the first and third gratings are arranged on the same side of the second grating, and

the second grating has ~~an indented shape with~~, in cross-section, ridges and valleys ~~and~~, a duty ratio of substantially 50%, ~~in which~~ and an optical path difference ~~between~~ for light incident at a ridge and light incident at a valley ~~of the second grating~~ is substantially equal to $\lambda/8$, where λ is wavelength of light.

Claim 7 (Cancelled).

8. (Currently Amended) ~~The~~ An optical encoder ~~according to Claim 1~~ comprising:

an incoherent light source;

a first grating, which is an amplitude grating having a first grating period, for spatial amplitude modulation of the incoherent light from the light source;

a second grating, which is a phase grating having a second grating period, for spatial phase modulation of light from the first grating;

a third grating, which is an amplitude grating having a third grating period, for spatial amplitude modulation of light from the second grating; and

a light detecting element for detecting light from the third grating, wherein

the encoder detects relative displacement between respective gratings,

the second grating has a period P,

the first and third gratings have a period 2P, and

both a first distance between the first and second gratings and a second distance between the second and third gratings are substantially odd integer multiples of $P^2/(4\lambda)$, where λ is wavelength of light.

9. (Currently Amended) The optical encoder according to Claim ~~1~~ 5, wherein the second grating is a phase grating ~~in~~ which has, in cross-section, ridges and valleys continuously varying in a sinusoidal shape so that the optical path ~~difference~~ length of incident light varies sinusoidally with position along the second grating.

10. (Currently Amended) ~~The~~ An optical encoder ~~according to Claim 1~~ comprising:

an incoherent light source;

a first grating, which is an amplitude grating having a first grating period, for spatial amplitude modulation of the incoherent light from the light source;

a second grating, which is a phase grating having a second grating period, for spatial phase modulation of light from the first grating;

a third grating, which is an amplitude grating having a third grating period, for spatial amplitude modulation of light from the second grating; and

a light detecting element for detecting light from the third grating, wherein

the encoder detects relative displacement between respective gratings,

a first distance between the first and second gratings is different from a second distance between the second and third gratings, and

the ratio of the first distance to the second distance is substantially equal to the ratio of the first grating period of the first grating to the third grating period of the third grating.

11. (Currently Amended) The optical encoder according to Claim ~~1~~ 5, wherein the first, second, and third gratings have rotary scales.

12. (Currently Amended) The optical encoder according to Claim ~~1~~ 5, wherein the first grating has a spatial distribution of light transmittance that varies sinusoidally with position along the first grating.

13. (Currently Amended) The optical encoder according to Claim ~~1~~ 5, including a plurality of ~~the~~ light detecting elements, wherein the light detecting elements are arranged discretely ~~at~~ opposite respective light transmitting portions of the third grating ~~period~~, and the third grating and the light detecting elements are integrated with each other.

14. (New) The optical encoder according to Claim 6, wherein the second grating is a phase grating which has, in cross-section, ridges and valleys continuously varying in a sinusoidal shape so that the optical path length of incident light varies sinusoidally with position along the second grating.

15. (New) The optical encoder according to Claim 6, wherein the first, second, and third gratings have rotary scales.

16. (New) The optical encoder according to Claim 6, wherein the first grating has a spatial distribution of light transmittance that varies sinusoidally with position along the first grating.

17. (New) The optical encoder according to Claim 6, including a plurality of light detecting elements, wherein the light detecting elements are arranged discretely opposite respective light transmitting portions of the third grating, and the third grating and the light detecting elements are integrated with each other.

18. (New) The optical encoder according to Claim 8, wherein the second grating is a phase grating which has, in cross-section, ridges and valleys continuously varying in a sinusoidal shape so that the optical path length of incident light varies sinusoidally with position along the second grating.

19. (New) The optical encoder according to Claim 8, wherein the first, second, and third gratings have rotary scales.

20. (New) The optical encoder according to Claim 8, wherein the first grating has a spatial distribution of light transmittance that varies sinusoidally with position along the first grating.

21. (New) The optical encoder according to Claim 8, including a plurality of light detecting elements, wherein the light detecting elements are arranged discretely opposite respective light transmitting portions of the third grating, and the third grating and the light detecting elements are integrated with each other.

22. (New) The optical encoder according to Claim 10, wherein the second grating is a reflective phase grating, and the first and third gratings are arranged on the same side of the second grating.

23. (New) The optical encoder according to Claim 10, wherein the second grating is a phase grating which has, in cross-section, ridges and valleys continuously varying in a sinusoidal shape so that the optical path length of incident light varies sinusoidally with position along the second grating.

24. (New) The optical encoder according to Claim 10, wherein the first, second, and third gratings have rotary scales.

25. (New) The optical encoder according to Claim 10, wherein the first grating has a spatial distribution of light transmittance that varies sinusoidally with position along the first grating.

26. (New) The optical encoder according to Claim 10, including a plurality of light detecting elements, wherein the light detecting elements are arranged discretely opposite respective light transmitting portions of the third grating, and the third grating and the light detecting elements are integrated with each other.